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BIOLOGICAL INTEGRITY
OF CASINO CREEK, FERGUS COUNTY, MONTANA
BASED ON THE COMPOSITION AND STRUCTURE
OF THE BENTHIC ALGAE COMMUNITY

Prepared for:

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SUMMARY

On August 8, 2000, periphyton samples were collected from two stations on Casino Creek near Lewistown, Montana for the purpose of assessing whether the creek is water-quality limited and in need of TMDLs. The samples were collected following DEQ standard operating procedures, processed and analyzed using standard methods for periphyton, and evaluated following modified USEPA rapid bioassessment protocols for wadeable streams.

Casino Creek heads in the foothills of the Big Snowy Mountains and flows for most of its length through a grassland ecoregion. For this reason, Casino Creek metrics were compared to criteria for both mountain streams and prairie streams.

When compared to biocriteria for mountain streams, the siltation index indicated **partial support of aquatic life uses** at both sampling sites. Siltation was worse at the upper site. When compared to criteria for plains streams, the siltation index indicated only minor impairment and full support of aquatic life uses at C 1, and no impairment at C 2.

A relatively large number of teratological diatom cells indicated possible chemical toxicity or environmental stress at C 2, and only **partial support of aquatic life uses**. The source of this toxicity or stress is unknown.

The non-diatom algal assemblages and the diatom pollution index both indicated small increases in nutrient concentrations and organic loading between sites C 1 and C 2.

The relatively low similarity index indicated that sites C 1 and C 2 had only somewhat similar diatom floras and that a moderate amount of environmental change had occurred between the two sites.

INTRODUCTION

This report evaluates the biological integrity, support of aquatic life uses, and probable causes of impairment to those uses, in Casino Creek near Lewistown, Montana. The purpose of this report is to provide information that will help the State of Montana determine whether Casino Creek is water-quality limited and in need of TMDLs.

The federal Clean Water Act directs states to develop water pollution control plans (Total Maximum Daily Loads or TMDLs) that set limits on pollution loading to water-quality limited waters. Water-quality limited waters are lakes and stream segments that do not meet water-quality standards, that is, that do not fully support their beneficial uses. The Clean Water Act and USEPA regulations require each state to (1) identify waters that are water-quality limited, (2) prioritize and target waters for TMDLs, and (3) develop TMDL plans to attain and maintain water-quality standards for all water-quality limited waters.

Evaluation of use support in this report is based on the species composition and structure of the periphyton (benthic algae, phytobenthos) community at two stream sites that were sampled on August 8, 2000. The periphyton community is a basic biological component of all aquatic ecosystems. Periphyton accounts for much of the primary production and biological diversity in Montana streams (Bahls et al. 1992).

Plafkin et al. (1989) and Stevenson and Bahls (1999) list several advantages of using periphyton in biological assessments:

- Algae are universally present in large numbers in all streams and unimpaired periphyton assemblages typically support a large number (>30) of species;
- Algae have rapid reproduction rates and short life cycles, making them useful indicators of short-term impacts;

- As primary producers, algae are most directly affected by physical and chemical factors, such as temperature, nutrients, dissolved salts, and toxins;
- Sampling is quick, easy and inexpensive, and causes minimal damage to resident biota and their habitat;
- Standard methods and criteria exist for evaluating the composition, structure, and biomass of algal associations;
- Identification to species is straightforward for the diatoms, for which there is a large body of taxonomic and ecological literature;
- Excessive algae growth in streams is often correctly perceived as a problem by the public.
- Periphyton and other biological communities reflect the *biological integrity*¹ of waterbodies; restoring and maintaining the biological integrity of waterbodies is a goal of the federal Clean Water Act;
- Periphyton and other biological communities integrate the effects of different stressors and provide a measure of their aggregate impact; and
- Periphyton and other biological communities may be the only practical means of evaluating impacts from non-point sources of pollution where specific ambient criteria do not exist (e.g., impacts that degrade habitat or increase nutrients).

Periphyton is a diverse assortment of simple photosynthetic organisms, called algae, and other microorganisms that live attached to or in close proximity of the stream bottom. Most algae, such as the diatoms, are microscopic. Diatoms are distinguished by having a cell wall composed of opaline glass--hydrated amorphous silica. Diatoms often carpet a stream bottom with a slippery brown film.

¹ *Biological integrity* is defined as "the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of natural habitats within a region" (Karr and Dudley 1981).

Some algae, such as the filamentous greens, are conspicuous and their excessive growth may be aesthetically displeasing, deplete dissolved oxygen, interfere with fishing and fish spawning, clog water filters and irrigation intakes, create tastes and odors in drinking water, and cause other problems.

PROJECT AREA AND SAMPLING SITES

The project area is located in Fergus County near the city of Lewistown, Montana (pop. 6,368). Casino Creek heads in the foothills of the Big Snowy Mountains at an elevation of about 5,000 feet and flows north for about 15 miles to where it enters Big Spring Creek just south of Lewistown.

The Casino Creek watershed is within the Montana Valley and Foothill Prairies Ecoregion (Woods et al. 1999). The surface geology consists of metamorphic rocks of the Kootenai Formation overlain by Quaternary gravel deposits (Renfro and Feray 1972). Vegetation is mixed forest and grassland in the headwaters and grassland at lower elevations (USDA 1976).

Periphyton samples were collected at two sites on August 8, 2000 (Table 1). The upper site (C 1) is located just downstream of the road to Cottonwood Creek at an elevation of about 5,000 feet (Map 1). The lower site (C 2) is located at an elevation of about 4,100 feet just upstream of the reservoir near the mouth of Casino Creek (Map 2).

Land use in the Casino Creek watershed is mostly livestock and wildlife grazing. Casino Creek is classified B-1 in the Montana Surface Water Quality Standards. Several hundred gallons of used motor oil were released into Casino Creek near the end of February 1999. This oil did not appear to have an immediate effect upon the periphyton community (Bahls 1999).

METHODS

Periphyton samples were collected by Darrin Kron (Water Monitoring Section, MDEQ Monitoring and Data Management Bureau) following standard operating procedures of the MDEQ Planning, Prevention, and Assistance Division.

Using appropriate tools, microalgae were scraped, brushed, or sucked from natural substrates in proportion to the rank of those substrates at the study site. Macroalgae were picked by hand in proportion to their abundance at the site. All collections of microalgae and macroalgae were pooled into a common container and preserved with Lugol's solution.

The samples were examined to estimate the relative abundance and rank by biovolume of diatoms and genera of soft (non-diatom) algae according to the method described by Bahls (1993). Soft algae were identified using Dillard (1999), Prescott (1978), Smith (1950), and Whitford and Schumacher (1984). These books also served as references on the ecology of the soft algae, along with Palmer (1977).

After the identification of soft algae, the raw periphyton samples were cleaned of organic matter using sulfuric acid, and permanent diatom slides were prepared using Naphrax, a high refractive index mounting medium, following *Standard Methods for the Examination of Water and Wastewater* (APHA 1998). Between 401 and 412 diatom cells (802 to 824 valves) were counted at random and identified to species. The following were used as the main taxonomic and autecological references for the diatoms: Krammer and Lange-Bertalot 1986, 1988, 1991a, 1991b; Patrick and Reimer 1966, 1975. Lowe (1974) was also used as an ecological reference for the diatoms.

The diatom proportional counts were used to generate an

array of diatom association metrics (Table 2). A metric is a characteristic of the biota that changes in some predictable way with increased human influence (Barbour et al. 1999).

Metric values from Casino Creek were compared to numeric biocriteria or threshold values developed for streams in the Rocky Mountain and Great Plains Ecoregions of Montana (Tables 3 and 4). These criteria are based on metric values measured in least-impaired reference streams (Bahls et al. 1992) and on metric values measured in streams that are known to be impaired by various sources and causes of pollution (Bahls 1993). Because metrics from both sites indicated impairment (see Table 6), Protocol II (Bahls 1993) could not be used.

The criteria in Tables 3 and 4 distinguish among four levels of impairment and three levels of aquatic life use support: no impairment or only minor impairment (full support); moderate impairment (partial support); and severe impairment (nonsupport). These impairment levels correspond to excellent, good, fair, and poor *biological integrity*, respectively.

Quality Assurance. Several steps were taken to assure that the study results are accurate and reproducible.

Upon receipt of the samples, station and sample information were recorded in a laboratory notebook and the samples were assigned a unique number compatible with the Montana Diatom Database, e.g., 2002-01. The first part of this number (2002) designates the sampling site (Casino Creek Station 1); the second part of this number (01) designates the number of periphyton samples that have been collected at this site to date for which data have been entered into the Montana Diatom Database.

Sample observations and analyses of soft (non-diatom) algae were recorded in a lab notebook along with station and sample information provided by MDEQ. A portion of the raw sample was used to make duplicate diatom slides. After completing the diatom proportional count, the slide used for the count will be deposited in the University of Montana Herbarium in Missoula. The other slide will be retained by *Hannaea* in Helena.

On completion of the project, station information, sample information, and diatom proportional count data will be entered into the Montana Diatom Database.

RESULTS AND DISCUSSION

Results are presented in Tables 5 and 6, which are located near the end of this report following the Literature Cited section. Spreadsheets containing completed diatom proportional counts, with species' pollution tolerance classes (PTC) and percent abundances, are attached as Appendix A.

SAMPLE NOTES

C 1. Mosses were present in this sample. The *Protoderma* here was growing on organic debris. The *Lyngbya* in this sample had a very distinct sheath and the trichomes were much wider than those of *Phormidium*.

C 2. The sample from this site contained an unknown genus of cyanobacteria. *Audouinella*, *Oedogonium*, *Rhoicosphenia* and *Cocconeis* were present as epiphytes on *Cladophora*.

NON-DIATOM ALGAE

The periphyton samples from both sites contained a mix of green algae, diatoms, red algae, and cyanobacteria (Table 5). Red algae are generally more sensitive to pollution than other types, although *Audouinella*, the red alga found in Casino Creek, is somewhat tolerant of pollution. Occasional cells of *Euglena* were observed at C 2. The presence of this pollution-tolerant euglenoid alga suggests some organic loading at this site.

Diatoms ranked first in biovolume at both sites, followed by cyanobacteria (mostly *Lyngbya*) at C 1 and by green algae (mostly *Cladophora*) at C 2. The decline in nitrogen-fixing cyanobacteria and the increase in green algae from C 1 to C 2 may indicate an increase in nutrient concentrations between these sites. Certain cyanobacteria (blue-green algae) are typical of mountain streams with lower nutrient levels in Montana (Bahls et al. 1992). They cannot compete with diatoms and green algae under moderate to heavy nutrient loading.

Cladophora, which was absent at C 1 but common at C 2, is a widespread alga that often becomes a nuisance in waters that are enriched with nutrients. *Protoderma*, the only green alga found at C 1, grows primarily on submerged macrophytes (Smith 1950).

DIATOMS

The major diatom species in Casino Creek were both tolerant of and sensitive to organic pollution (Table 6). The percent abundance of tolerant and sensitive species was about the same at the two sites, resulting in almost identical pollution indexes. The pollution index declined slightly between C 1 and C 2, indicating a small increase in organic loading between these sites. The pollution index indicated minor impairment for a mountain stream and no impairment when compared to biocriteria for a prairie stream (Table 4).

Diatom species richness and diversity were excellent for a mountain stream and good for a prairie stream (Table 6). The percent dominant species indicated minor stress at both sites. The relatively low percentage of *Achnanthes minutissima*, an opportunistic pioneer species, indicated minimal biological, chemical, or physical disturbance at both sites.

The relatively large number of cells in the motile genera *Navicula* and *Nitzschia* indicated moderate impairment from siltation at both sites (Table 6). However, when compared to diatom criteria for prairie streams, siltation caused only minor impairment at C 1 and no impairment at C 2.

No diatom cells exhibiting physical abnormalities were observed at site C 1. Nine (9) abnormal cells representing four species were counted at C 2, indicating moderate impairment at this site. The percentage of teratological cells has been correlated with ambient concentrations of heavy metals in certain Colorado streams (McFarland et al. 1997). Teratological cells may also result from other forms of pollution and environmental stress.

No diatom species in the family Epithemiaceae were counted, indicating that nitrogen was probably not limiting to algal growth at either site. Diatoms in this family often harbor nitrogen-fixing cyanobacteria within their cells and are most often found in waters where nitrogen is the limiting nutrient.

The relatively low similarity index (41.52) indicated that the two sites had only somewhat similar diatom floras and that a moderate amount of change had occurred between the two sites. Adjacent reaches on the same stream, without intervening tributaries or pollution sources, can expect to have at least 60% of their diatom floras in common (Bahls 1993).

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Table 1. Location of periphyton stations on Casino Creek sampled August 8, 2000: Station codes, sample numbers in the Montana Diatom Database, and latitudes and longitudes. Stations are listed in order from upstream to downstream.

Location	Station Code	Sample Number	Latitude/ Longitude
Casino Creek headwaters below Cottonwood Road	C 1	2002-01	46 57 21 109 26 27
Casino Creek upstream of reservoir	C 2	2003-01	47 01 29 109 26 15

Table 2. Diatom association metrics used to evaluate biological integrity in Montana streams: reference, range of values in Montana streams, and expected direction of metric response to increasing anthropogenic perturbation or natural stress.

Metric	Reference	Range of Values	Expected Response
Shannon Species Diversity	Bahls 1979	0.00-5.00+	Decrease ¹
Pollution Index ²	Bahls 1993	1.00-3.00	Decrease
Siltation Index ³	Bahls 1993	0.00-90.0+	Increase
Disturbance Index ⁴	Barbour et al. 1999	0.00-100.0	Increase
No. Species Counted	Bahls 1979, 1993	0-100+	Decrease ¹
Percent Dominant Species	Barbour et al. 1999	5.0-100.0	Increase
Percent Abnormal Cells	McFarland et al. 1997	0.0-20.0+	Increase
Similarity Index	Whittaker 1952	0.0-80.0+	Decrease
Percent Epithemiaceae	Stevenson & Pan 1999	0.0-80.0+	Decrease
Percent Aerophiles	Johansen 1999	0.0-100	Increase

¹ Shannon diversity and species richness may increase somewhat in naturally nutrient-poor mountain streams in response to slight to moderate increases in nutrients or sediment.

² Composite numeric expression of the pollution tolerances assigned by Lange-Bertalot (1979) to the common diatom species.

³ Sum of the percent abundances of all species in the genera *Navicula*, *Nitzschia*, and *Surirella*, plus the species *Cymbella sinuata*.

⁴ Percent abundance of *Achnanthes minutissima*.

Table 3. Criteria for rating levels of biological integrity, environmental impairment or natural stress, and aquatic life use support in wadeable **mountain** streams of Montana using selected metrics for benthic diatom associations. The lowest rating for any one metric is the overall rating for the study site.

Biological Integrity/ Impairment or Natural Stress/Use Support	Diversity Index (Shannon)	Pollution Index	Siltation Index	Disturbance Index	Number of Species Counted	Percent Dominant Species	Percent Abnormal Cells	Percent Similarity Index ¹
Excellent None/Full Support	>2.99	>2.50	<20.0	<25.0	>29	<25.0	0.0	>59.9
Good/Minor Full Support	2.00- 2.99	2.01- 2.50	20.0- 39.9	25.0- 49.9	20- 29	25.0- 49.9	>0.0- <1.0	40.0- 59.9
Fair/Moderate Partial Support	1.00- 1.99	1.50- 2.00	40.0- 59.9	50.0- 74.9	10- 19	50.0- 74.9	1.0- 9.9	20.0- 39.9
Poor/Severe Nonsupport	<1.00	<1.50	>59.9	>74.9	<10	>74.9	>9.9	<20.0

¹ The Similarity Index or Percent Community Similarity (Whittaker 1952) may be used to compare a study site to an unimpaired upstream control site on the same stream. This metric measures the degree of floristic similarity between diatom associations at the two sites and is the sum of the smaller of the two percent abundance values for each species that is common to both sites. Adjacent riffles on the same stream, without intervening tributaries or environmental perturbations, will generally have at least 60% of their diatom floras in common (Bahls 1993). PCS may also be used to gauge the relative amount of impairment or recovery that occurs between adjacent study sites: >59.9% = very similar floras, no change; 40.0-59.9% = somewhat similar floras, minor change; 20.0-39.9% = somewhat dissimilar floras, moderate change; <20.0% = very dissimilar floras, major change.

Table 4. Criteria for rating levels of biological integrity, environmental impairment or natural stress, and aquatic life use support in Wadeable Plains streams of Montana using selected metrics for benthic diatom associations. The lowest rating for any one metric is the overall rating for the study site.

Biological Integrity/ Impairment or Natural Stress/Use Support	Diversity Index (Shannon)	Pollution Index	Siltation Index	Disturbance Index	Number of Species Counted	Percent Dominant Species	Percent Abnormal Cells	Percent Similarity Index ¹
Excellent None/Full Support	>3.99	>2.25	<50.0	<25.0	>39	<25.0	0.0	>59.9
Good/Minor Full Support	3.00- 3.99	1.76- 2.25	50.0- 69.9	25.0- 49.9	30- 39	25.0 49.9	>0.0- <1.0	40.0- 59.9
Fair/Moderate Partial Support	2.00- 2.99	1.25- 1.75	70.0- 89.9	50.0- 74.9	20- 29	50.0- 74.9	1.0- 9.9	20.0- 39.9
Poor/Severe Nonsupport	<2.00	<1.25	>89.9	>74.9	<20	>74.9	>9.9	<20.0

¹ The Similarity Index or Percent Community Similarity (Whittaker 1952) may be used to compare a study site to an unimpaired upstream control site on the same stream. This metric measures the degree of floristic similarity between diatom associations at the two sites and is the sum of the smaller of the two percent abundance values for each species that is common to both sites. Adjacent riffles on the same stream, without intervening tributaries or environmental perturbations, will generally have at least 60% of their diatom floras in common (Bahls 1993). PCS may also be used to gauge the relative amount of impairment or recovery that occurs between adjacent study sites: >59.9% = very similar floras, no change; 40.0-59.9% = somewhat similar floras, minor change; 20.0-39.9% = somewhat dissimilar floras, moderate change; <20.0% = very dissimilar floras, major change.

Table 5. Relative abundance of cells and rank by biovolume of diatoms and genera of non-diatom algae in periphyton samples collected from Casino Creek near Lewistown, Montana on August 8, 2000.

Taxa	<u>Relative Abundance and (Rank)</u>	
	C 1	C 2
Chlorophyta (green algae)		
<i>Ankistrodesmus</i>		occasional (10)
<i>Cladophora</i>		common (2)
<i>Oedogonium</i>		occasional (7)
<i>Protoderma</i>	common (3)	frequent (4)
Euglenophyta (euglenoid algae)		
<i>Euglena</i>		occasional (9)
Chrysophyta (golden algae)		
Bacillariophyceae (diatoms)	frequent (1)	frequent (1)
Rhodophyta		
<i>Audouinella</i>	occasional (5)	frequent (3)
Cyanophyta (cyanobacteria) ¹		
<i>Lyngbya</i>	frequent (2)	
<i>Oscillatoria</i>	occasional (6)	occasional (6)
<i>Phormidium</i>	common (4)	frequent (5)
unknown ²		occasional (8)

¹ Formerly known as blue-green algae.

² Thallus is filamentous with false branching; heterocysts lacking; cells elongate oblong, enclosed in a firm sheath, end walls not touching; starch test negative.

Table 6. Percent abundance of major diatom species¹ and values of selected diatom association metrics for periphyton samples collected from Casino Creek near Lewistown, Montana on August 8, 2000.

Species/Metric (Pollution Tolerance Class) ³	Percent Abundance/Metric Values ²			
	Mountain Criteria		Plains Criteria ⁴	
	C 1	C 2	C 1	C 2
<i>Achnanthes minutissima</i> (3)	15.17	12.72		
<i>Amphora pediculus</i> (3)	0.61	32.04		
<i>Gomphonema kobayasii</i> (3)	8.13			
<i>Gomphonema parvulum</i> (1)	6.19	2.74		
<i>Navicula cryptotenella</i> (2)	27.91	11.72		
<i>Navicula minima</i> (1)	0.49	8.73		
<i>Navicula tripunctata</i> (3)	7.52	1.87		
<i>Nitzschia dissipata</i> (3)	15.17	2.37		
Cells Counted	412	401		
Total Species	43	53		
Species Counted	41	46		
Species Diversity	3.48	3.68	<u>3.48</u>	<u>3.68</u>
Percent Dominant Species	<u>27.91</u>	<u>32.04</u>	<u>27.91</u>	<u>32.04</u>
Disturbance Index	15.17	12.72		
Pollution Index	<u>2.49</u>	<u>2.44</u>		
Siltation Index	59.10	40.77	<u>59.10</u>	
Percent Abnormal Cells	0.00	2.12		2.12
Percent Epithemiaceae	0.00	0.00		
Similarity Index		41.52		

¹ A major diatom species is here considered to be one that accounts for 5% or more of the cells in one or more samples of a sample set.

² Underlined values indicate good biological integrity, minor impairment, and full support of aquatic life uses; **bold values** indicate fair biological integrity, moderate impairment, and partial support of aquatic life uses; all other values indicate excellent biological integrity, no impairment, and full support of aquatic life uses when compared to diatom criteria for mountain and plains streams in Tables 3 and 4.

³ 3 = sensitive to pollution; 2 = tolerant of pollution; 1 = most tolerant of pollution.

⁴ Only metric values that exceed diatom biocriteria for plains streams are shown.

APPENDIX A: DIATOM PROPORTIONAL COUNTS

Casino Creek headwaters below Cottonwood Road

Sample	Genus/Species/Variety	Pollution Tolerance Cla
200201	Achnanthes lanceolata	
200201	Achnanthes minutissima	
200201	Amphora inariensis	
200201	Amphora libyca	
200201	Amphora pediculus	
200201	Caloneis bacillum	
200201	Cocconeis placentula	
200201	Cymbella affinis	
200201	Cymbella silesiaca	
200201	Fragilaria leptostauron	
200201	Fragilaria vaucheriae	
200201	Gomphonema dichotomum	
200201	Gomphonema kobayasii	
200201	Gomphonema mexicanum	
200201	Gomphonema minutum	
200201	Gomphonema olivaceum	
200201	Gomphonema parvulum	
200201	Gyrosigma spencerii	
200201	Melosira varians	
200201	Navicula capitatoradiata	
200201	Navicula cryptocephala	
200201	Navicula cryptotenella	
200201	Navicula exilis	
200201	Navicula gregaria	
200201	Navicula lanceolata	
200201	Navicula lenzii	
200201	Navicula menisculus	
200201	Navicula minima	
200201	Navicula reichardtiana	
200201	Navicula tripunctata	
200201	Navicula trivialis	
200201	Nitzschia alpina	
200201	Nitzschia dissipata	
200201	Nitzschia fonticola	
200201	Nitzschia frustulum	
200201	Nitzschia gracilis	
200201	Nitzschia heufleriana	
200201	Nitzschia inconspicua	
200201	Nitzschia palea	
200201	Nitzschia sociabilis	
200201	Rhoicosphenia curvata	
200201	Surirella minuta	
200201	Synedra ulna	

Sample	Genus/Species/Variety	Pollution Tolerance Class	Count	Percent
200301	Achnanthes biasolettiana	3	9	1.12
200301	Achnanthes lanceolata	2	4	0.50
200301	Achnanthes minutissima	3	102	12.72
200301	Amphora inariensis	3	9	1.12
200301	Amphora libyca	3	1	0.12
200301	Amphora pediculus	3	257	32.04
200301	Caloneis bacillum	2	8	1.00
200301	Cocconeis pediculus	3	2	0.25
200301	Cocconeis placentula	3	29	3.62
200301	Cyclotella pseudostelligera	2	1	0.12
200301	Cymatopleura solea	2	0	0.00
200301	Cymbella silesiaca	2	1	0.12
200301	Diatoma vulgaris	3	1	0.12
200301	Fragilaria construens	3	0	0.00
200301	Gomphonema angustatum	2	1	0.12
200301	Gomphonema minutum	3	23	2.87
200301	Gomphonema parvulum	1	22	2.74
200301	Navicula acceptata	2	3	0.37
200301	Navicula atomus	1	1	0.12
200301	Navicula capitata	2	1	0.12
200301	Navicula capitatoradiata	2	21	2.62
200301	Navicula cryptocephala	3	0	0.00
200301	Navicula cryptotenella	2	94	11.72
200301	Navicula gregaria	2	1	0.12
200301	Navicula lanceolata	2	0	0.00
200301	Navicula lenzii	2	5	0.62
200301	Navicula menisculus	2	2	0.25
200301	Navicula minima	1	70	8.73
200301	Navicula protracta	2	0	0.00
200301	Navicula pupula	2	7	0.87
200301	Navicula reichardtiana	2	4	0.50
200301	Navicula subminuscula	1	3	0.37
200301	Navicula tripunctata	3	15	1.87
200301	Navicula trivialis	2	2	0.25
200301	Navicula veneta	1	2	0.25
200301	Navicula viridula	2	17	2.12
200301	Nitzschia amphibia	2	4	0.50
200301	Nitzschia apiculata	2	0	0.00
200301	Nitzschia calida	2	1	0.12
200301	Nitzschia dissipata	3	19	2.37
200301	Nitzschia fonticola	3	1	0.12
200301	Nitzschia frustulum	2	23	2.87
200301	Nitzschia inconspicua	2	3	0.37
200301	Nitzschia linearis	2	3	0.37
200301	Nitzschia palea	1	18	2.24
200301	Nitzschia sigmoidea	3	0	0.00
200301	Nitzschia solita	1	3	0.37
200301	Nitzschia tryblionella	2	1	0.12
200301	Reimeria sinuata	3	1	0.12
200301	Rhoicosphenia curvata	3	1	0.12
200301	Simonsenia delognei	2	1	0.12
200301	Surirella minuta	2	4	0.50
200301	Synedra ulna	2	1	0.12